Year 13 Topics Computing

Each topic develops and deepens the Core knowledge that will underpin all areas of the curriculum at KS4 and KS5.

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment
Fundamentals of programming	Recap the basic operation of a typical programming language, becoming familiar with programming terms and capability. Specific focus on procedural- and object-oriented programming	Programming paradigms Procedural-oriented programming Object-oriented programming	Data types Programming concepts Arithmetic operations in a programming language Constants and variables in a programming language Boolean operations in a programming language String-handling operations in a programming language Random number generation in a programming language Subroutines-procedures/functions Parameters and subroutines Object-oriented programming	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Fundamentals of data structures	Recap the concept and application of a data type and data structures, with introduction to the themes in red	Data structures and abstract data types Queues Stacks Graphs Trees Vectors	Abstract data types/data structures Queues Stacks Graphs Trees Vectors Dictionaries	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Fundamentals of algorithms	Continue to develop programming ability through a range of algorithms and notation	Graph-traversal Tree-traversal Reverse polish Searching algorithms Sorting algorithms Optimisation algorithms	Dijkstra	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment
Theory of computation	Continue to develop approach to problem solving, testing and evaluation, using specific languages and models	Abstraction and automation Regular languages Context-free languages Classification of algorithms A model of computation	Finite state machines (FSMs) regular expressions Mealy Machine Backus-Naur form (BNF) / syntax diagrams Big-O Order of complexity Turning	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Fundamentals of data representation	Recap different representations of data such as graphics, sound and number	Number systems Number bases Units of information Binary number systems Information coding systems Representing images, sound and other data	Natural numbers Rational numbers Real numbers two's complement Absolute error Relative errors Underflow and overflow ASCII Unicode Error checking and correction Musical instrument digital interface (MIDI) Data compression Encryption	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Fundamentals of computer systems	Revisit programming languages and the mathematics of logic gates and Boolean algebra	Hardware and software Classification of programming languages Types of program translator Logic gates Boolean algebra	System software operating system assembler compiler interpreter • NOT • AND • OR • XOR • NAND • NOR	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment
Fundamentals of computer organisation and architecture	Recap the internal components of the computer and associated hardware	Internal hardware components of a computer The stored program concept Structure and role of the processor and its components External hardware devices	processor main memory address bus data bus control bus I/O controller control unit clock general-purpose registers dedicated registers, including: program counter current instruction register memory address register memory buffer register status register	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Consequences of uses of computing	Discuss the impact computing has on the world	Individual (moral), social (ethical), legal and cultural issues and opportunities	Cyber attack Hack Internet Destruction of jobs User-generated content Trolls Ethics Legislators Digital age	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Fundamentals of communication and networking	Recap the possible formation of networks	Networking The TCP/IP protocol The Internet Communication	Standard application layer protocols TCP/IP Dynamic host configuration protocol (DHCP) Network address translation (NAT) Port forwarding Client server model Thin / thick-client computing	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills

Topic	Rationale	Knowledge acquisition	Key vocabulary	Skills and enrichment
Fundamentals of database	Recap database design and SQL	Database design and normalisation techniques Structured Query Language (SQL)	Entity relationship modelling Relational databases Normalisation SQL Defining tables Updating tables	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Big data	Understand the term big data and analysing big data	Big data	Nodes Edge graph schema	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Fundamentals of functional programming	Understand the concept of functional programming	Functional programming paradigms	List processing Composition of functions First-class object	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills
Systematic approach to problem solving	Continue to develop approach to problem solving, with a focus on software development	Aspects of software development	Testing Implementation Design Analysis	Independence Evaluation Analysis Literacy Oracy Research skills Note taking skills